Accelerated closure of skin wounds in mice deficient in the homeobox gene Msx2.

Journal: Wound Repair Regen

Publication Year: 2009

Authors: Jennifer Yeh, Lydia M Green, Ting-Xin Jiang, Maksim Plikus, Eunice Huang, Richard N Chang, Michael W Hughes, Cheng-Ming Chuong, Tai-Lan Tuan

PubMed link: 19769717

Funding Grants: CIRM Stem Cell Biology Training Grant

Public Summary:
In summary, consistent with the notion suggested in earlier correlated studies, this study presents an example in which the presence or absence of a homeobox gene can affect the course of wound healing by altering the timing of proliferation and differentiation. The study also pointed out that Msx2 expression may be important for the homeostasis of the proliferation and maturation process of basal keratinocytes in the interfollicular epidermis and subsequently mesenchymal activities in the healing process. The understanding of these intrinsic cellular differences is fundamental to the eventual development of novel therapeutics for wound healing by modulating molecules constituting cellular competence.

Scientific Abstract:
Differences in cellular competence offer an explanation for the differences in the healing capacity of tissues of various ages and conditions. The homeobox family of genes plays key roles in governing cellular competence. Of these, we hypothesize that Msx2 is a strong candidate regulator of competence in skin wound healing because it is expressed in the skin during fetal development in the stage of scarless healing, affects postnatal digit regeneration, and is reexpressed transiently during postnatal skin wound repair. To address whether Msx2 affects cellular competence in injury repair, 3 mm full-thickness excisional wounds were created on the back of C.Cg-Msx2(tm1Rilm)/Mmcd (Msx2 null) mice and the healing pattern was compared with that of the wild type mice. The results show that Msx2 null mice exhibited faster wound closure with accelerated reepithelialization plus earlier appearance of keratin markers for differentiation and an increased level of smooth muscle actin and tenascin in the granulation tissue. In vitro, keratinocytes of Msx2 null mice exhibit increased cell migration and the fibroblasts show stronger collagen gel contraction. Thus, our results suggest that Msx2 regulates the cellular competence of keratinocytes and fibroblasts in skin injury repair.